OBSERVING DIFFERENT TYPES OF CHEMICAL REACTIONS

Name_____ **Date**_____ **Period**_____

A. Synthesis Reactions:

The word synthesis means, "to put together". In a chemical reaction involving synthesis, two or more substances combine to produce a single, more complex substance.

Activity: Observe a Synthesis Reaction

Observe the magnesium metal and record 2 physical properties of it below. Watch the teacher burn the magnesium metal in air. Observe the magnesium metal after the heating and record 2 physical properties of it below.

	Physical Properties
Magnesium before heating	
Magnesium after heating	

Questions:

1. What is the evidence that a chemical change occurred? _____
2. How many products are in a synthesis reaction? _____
3. Oxygen was one of the reactants in this reaction. Where did the oxygen come from? _____
4. Is this product of a synthesis reaction an element or a compound? _____

B. Decomposition Reactions:

Chemical decomposition is the opposite of chemical synthesis. In a decomposition reaction, a single compound is broken down into two or more simpler substances. Some compounds can decompose by themselves. Since hydrogen peroxide, for example, decomposes over time to form water and oxygen at room temperature, expiration dates are stamped on the bottles. In many cases heat, light or electricity is required to decompose compounds.

Activity: Observe a Decomposition Reaction

Observe the sugar and record 2 physical properties of it below. Watch the teacher heat the sugar. Observe and describe the sugar after it has been heated.

	Description
Sugar before being heated	
Sugar after being heated	

Questions:

1. What evidence do you have that a chemical change took place? _____
2. How many reactants are in a decomposition reaction? _____
3. What was necessary for this reaction to take place? _____

C. Single Replacement Reactions:

In a single replacement reaction, an uncombined element replaces an element that is combined in a compound. This rearrangement of atoms causes a new compound and element to be formed.

Activity: Observe 2 Single Replacement Reactions

Part A:

a. Obtain a dropping plate. Add 2-3 drops of HCl to the well. Observe the Mg and the HCl and record their colors in the data table below.

b. Drop the Mg into the solution and observe the Mg and the solution after sitting for a few minutes.

	Color
Mg (before put into solution)	
HCl (before Mg is added)	
Mg(after being in solution)	
HCl (after nail has been added)	

Part B:

c. Add 2-3 drops of silver nitrate and place it in a clean well.

d. Observe the copper nugget and the silver nitrate and record their color in the data table.

e. Drop the nugget into the solution and observe the copper. After the reaction has taken place, shake the "fuzz" off the nugget and the reaction will happen again.

f. Observe the color of the solution and record its new color.

	Color
Copper nugget (before put into solution)	
Silver nitrate (before nail is added)	
Copper nugget (after being in solution)	
Silver nitrate (after nail has been added)	

Questions:

1. When the magnesium was added to the Hydrochloric acid the following single replacement reaction occurred: *(Balance the equation if needed)*

$$Mg + HCl \longrightarrow MgCl_2 + H_2$$

What are the reactants? _____

What are the products? _____

2. What was your evidence that hydrogen was a product of the reaction? _____

3. When the copper nugget was added to the silver (III) nitrate the following single replacement reaction occurred: *(Balance the equation if needed)*

$$Cu + AgNO_3 \longrightarrow Cu(NO_3)_2 + Ag$$

What are the reactants? _____

What are the products? _____

4. What was your evidence that silver was a product of the reactions? _____

D. Double Replacement Reactions:

Some of the most impressive chemical reactions are double replacement reactions. In double replacement reactions, there are two compounds as the reactants. The negative ions of each compound switch places with each other resulting in two new compounds.

Observing Double Replacement Reactions:

a. Observe the NaOH solution and record the color below.
b. Observe the $CuSO_4$ and record the color below.
c. Put 3 drops of NaOH into a well.
d. Add 3 drops of $CuSO_4$ the NaOH.
e. Gently stir the well for 15 seconds.
f. Record the results.

	Color
NaOH	
$CuSO_4$	
	Result of reaction:
NaOH + $CuSO_4$	

g. Observe the Iron (III) nitrate and NaOH and record their color.
h. Put 2-3 drops of $Fe(NO_3)_3$ into a clean well.
i. Add 2-3 drops of NaOH to the iron (III) nitrate and record the results.

	Color
Iron (III) nitrate	
NaOH	
	Result of reaction:
$Fe(NO_3)_3$ + NaOH	

Questions:

1. The following is the equation for the 1st double replacement reaction you observed. Balance the equation: *(Balance the equation if needed)*

$$\mathbf{NaOH + CuSO_4 \longrightarrow Cu(OH)_2 + Na_2SO_4}$$

2. The following is the equation for the 2nd double replacement reaction you observed. Balance the equation:

$$\mathbf{Fe(NO_3)_3 + NaOH \longrightarrow Fe(OH)_3 + NaNO_3}$$

ANALYSIS OF TYPES OF REACTIONS LAB ACTIVITY

1. When you take the cap off a bottle of soda, bubble rise quickly to the top. This is because carbonated beverages, such as soda, contain the compound carbonic acid (H_2CO_3). This compound breaks down into water and carbon dioxide gas. The carbon dioxide gas is what makes up the bubbles that are released. Below is the equation for this reaction:

   $H_2CO_3 \longrightarrow H_2O + CO_2$

   What type of reaction is this? _____

2. If you have ever had an upset stomach, you may have taken a medicine that contained the compound magnesium carbonate. This compound reacts with the hydrochloric acid in your stomach in the following way:

   $\mathbf{MgCO_3 + HCl \longrightarrow MgCl_2 + H_2CO_3}$

   What type of reaction is this? _____

The product H_2CO_3 is then decomposed into water (H_2O) and carbon dioxide gas (CO_2). Your stomachache goes away because instead of too much acid in your stomach, there is now water and carbon dioxide.

3. Name the type of reaction for the following: *(Balance the equation if needed)*

   a. $\mathbf{2H_2O \longrightarrow 2H_2 + O_2}$ _____

   b. $\mathbf{NaOH + HCl \longrightarrow HOH + NaCl}$ _____

   c. $\mathbf{K + Cl_2 \longrightarrow KCl}$ _____

   d. $\mathbf{Pb(NO_3)_2 + K_2CrO_4 \longrightarrow PbCrO_4 + KNO_3}$ _____

   e. $\mathbf{KClO_3 \longrightarrow KCl + O_2}$ _____

   f. $\mathbf{Mg + HCl \longrightarrow H_2 + MgCl_2}$ _____

4. The reactants in a **synthesis reaction** are shown below. Write the BALANCED equations for the of the reactions below:

   $\mathbf{Na + Cl_2 \longrightarrow}$

5. The reactant of a **decomposition reaction** is shown below. Write in the products of the reaction.

   $\mathbf{CaS \longrightarrow}$

6. The reactants of a **single replacement reaction** are shown below. Write in the products of the reaction. (Hint: Iron has a charge of +2)

   $\mathbf{Fe + CuCl_2 \longrightarrow}$

7. The reactants of a **double replacement reaction** are shown below. Write in the products of the reaction. (Hint: you will have to determine the charge on silver.)

   $\mathbf{NaCl + AgNO_3 \longrightarrow}$